OIPE
JUL 07 2004
PATENT & TRADEMARK OFFICE
JC32

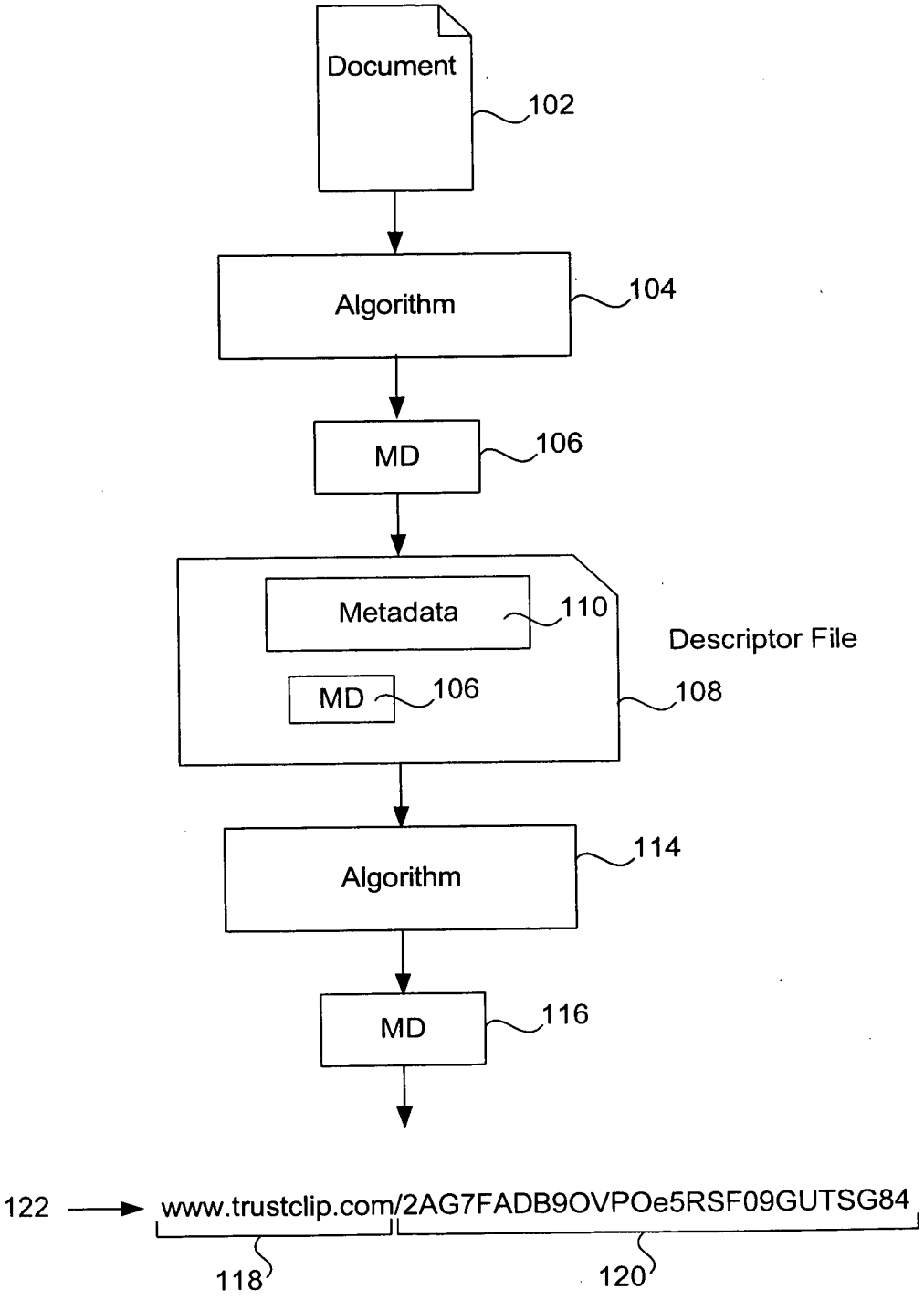


FIG. 1

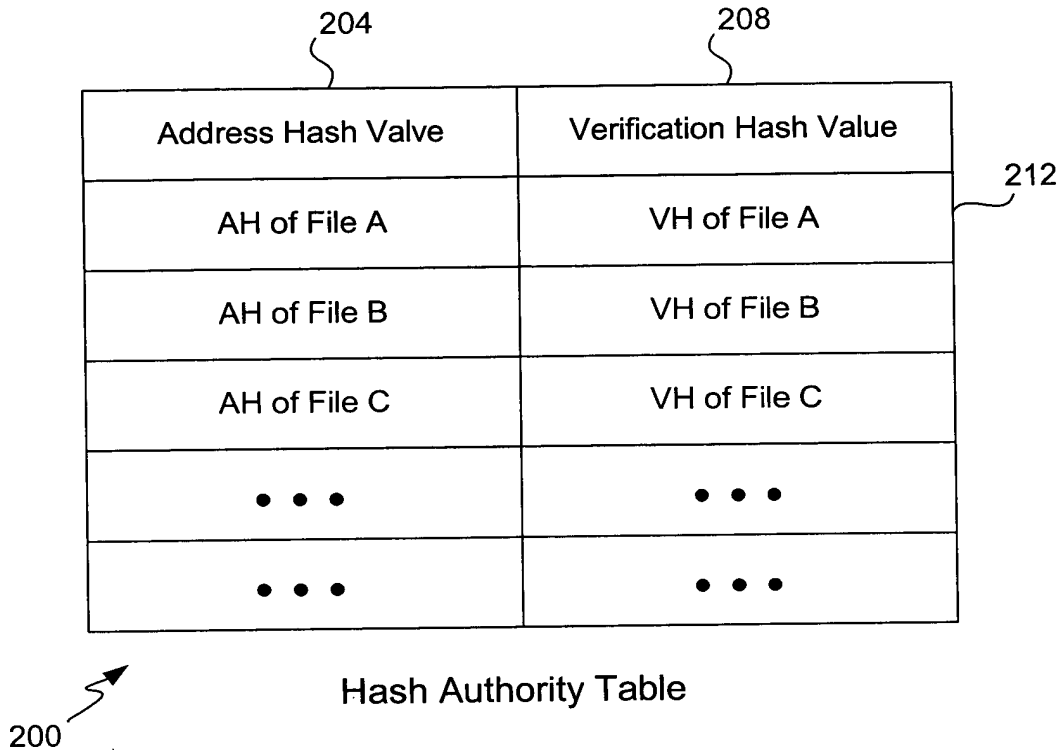

204
208
Address Hash Valve
Verification Hash Value
212
AH of File A
VH of File A
AH of File B
VH of File B
AH of File C
VH of File C
200
Hash Authority Table

FIG. 2

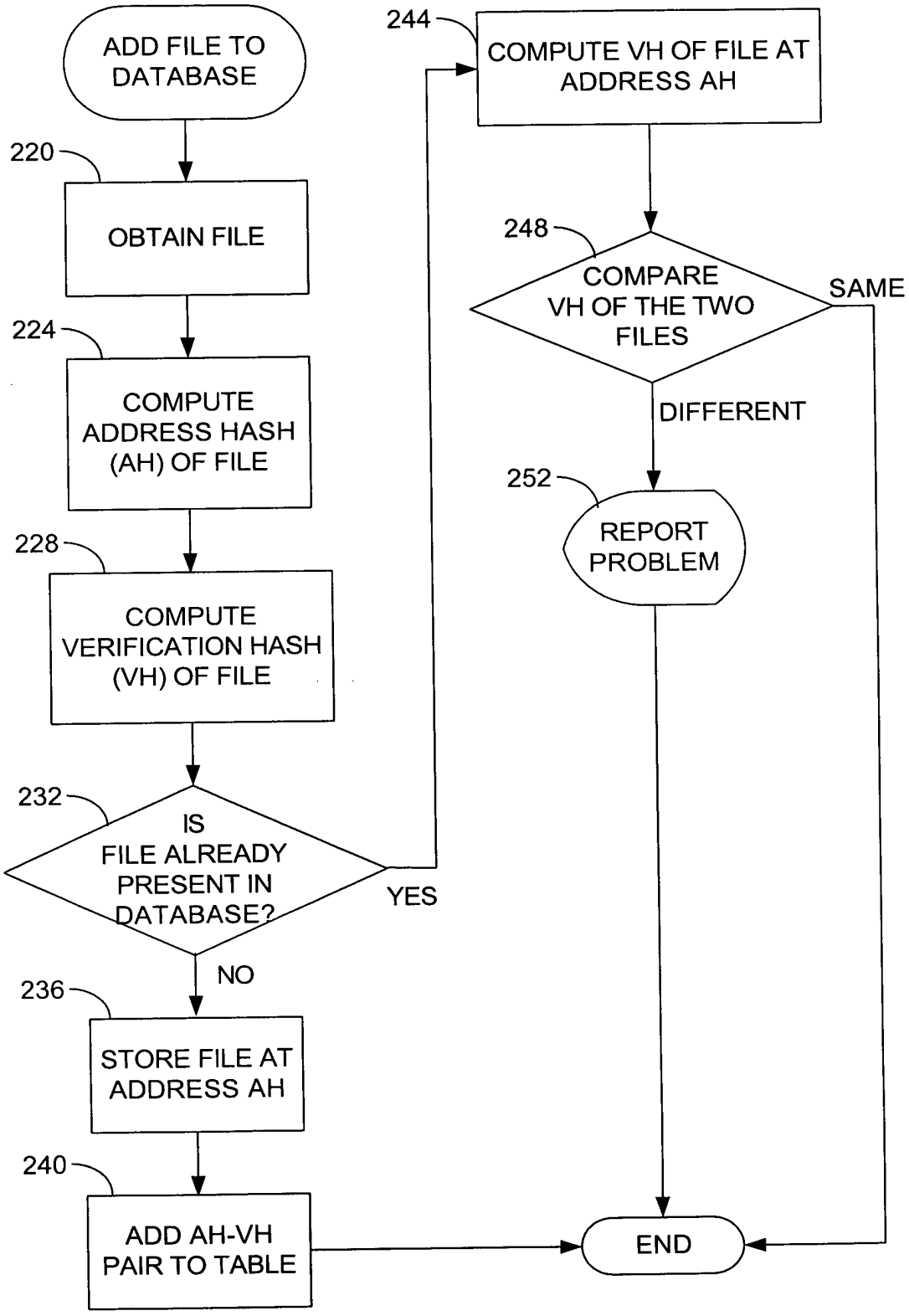

ADD FILE TO DATABASE
220
OBTAIN FILE
224
COMPUTE ADDRESS HASH (AH) OF FILE
228
COMPUTE VERIFICATION HASH (VH) OF FILE
232
IS FILE ALREADY PRESENT IN DATABASE?
YES
NO
236
STORE FILE AT ADDRESS AH
240
ADD AH-VH PAIR TO TABLE
244
COMPUTE VH OF FILE AT ADDRESS AH
248
COMPARE VH OF THE TWO FILES
SAME
DIFFERENT
252
REPORT PROBLEM
END

FIG. 3

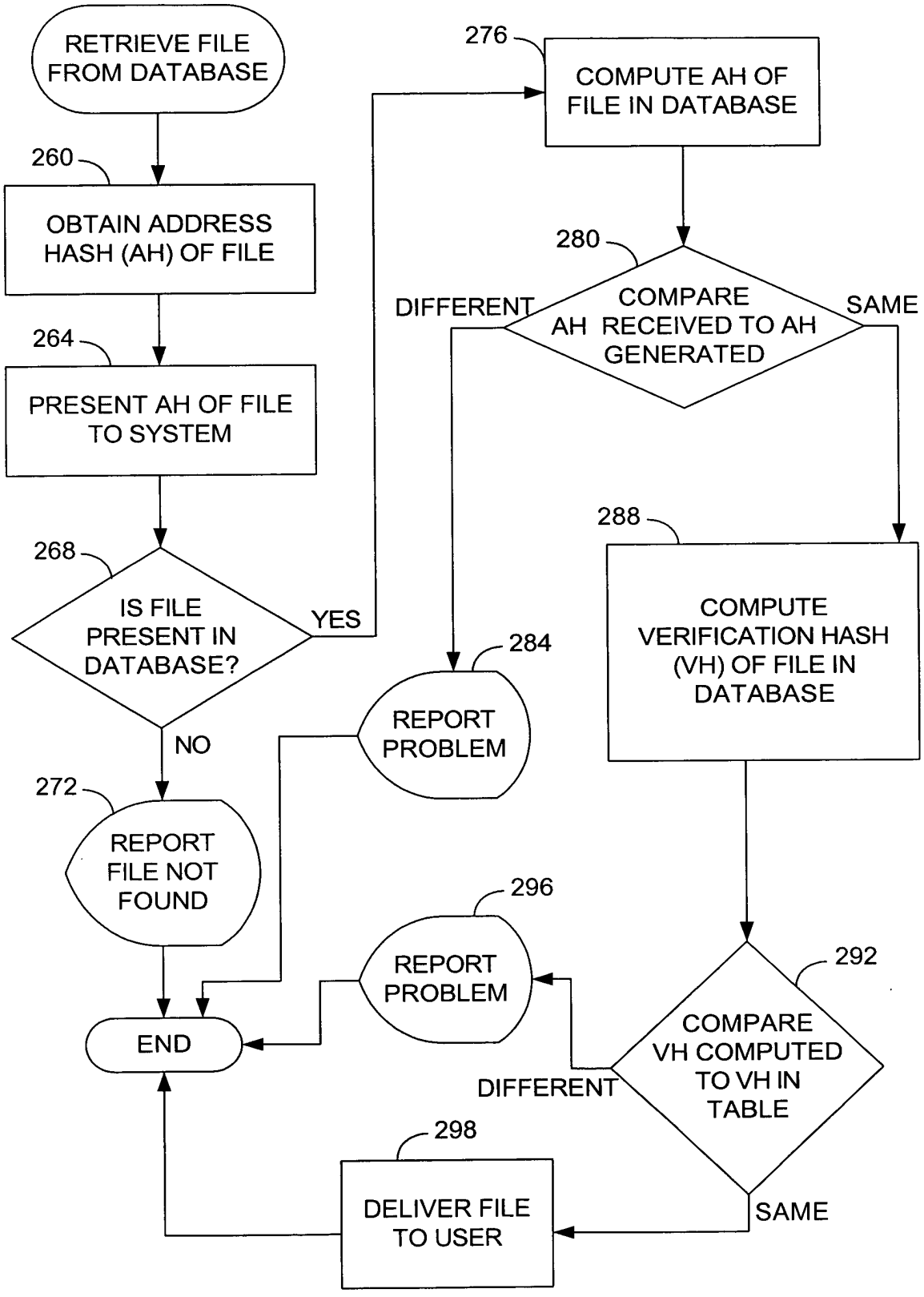

RETRIEVE FILE FROM DATABASE
260
OBTAIN ADDRESS HASH (AH) OF FILE
264
PRESENT AH OF FILE TO SYSTEM
268
IS FILE PRESENT IN DATABASE?
YES
NO
272
REPORT FILE NOT FOUND
END
276
COMPUTE AH OF FILE IN DATABASE
280
COMPARE AH RECEIVED TO AH GENERATED
DIFFERENT
SAME
284
REPORT PROBLEM
288
COMPUTE VERIFICATION HASH (VH) OF FILE IN DATABASE
296
REPORT PROBLEM
292
COMPARE VH COMPUTED TO VH IN TABLE
DIFFERENT
SAME
298
DELIVER FILE TO USER

FIG. 4

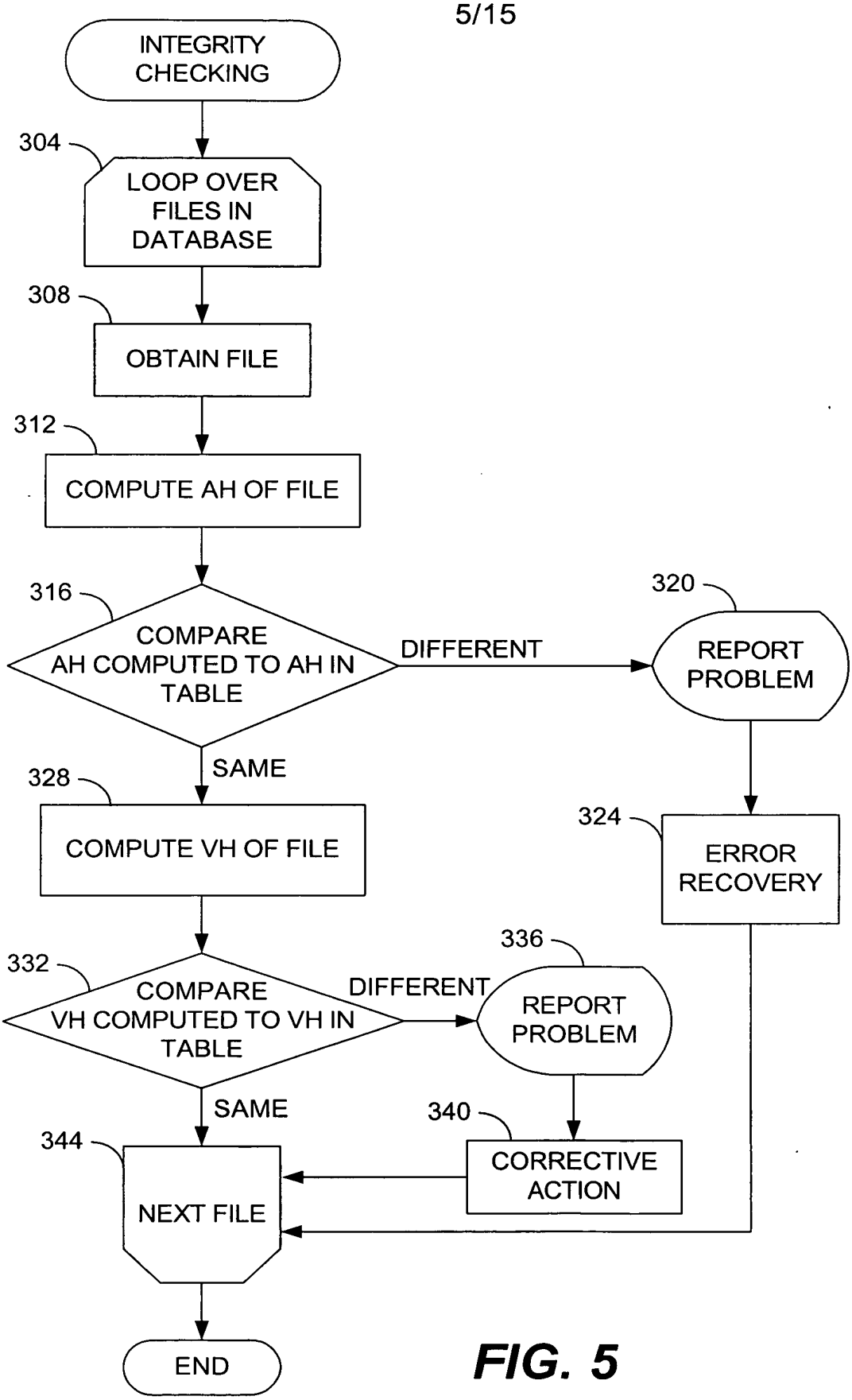

INTEGRITY CHECKING
304
LOOP OVER FILES IN DATABASE
308
OBTAIN FILE
312
COMPUTE AH OF FILE
316
COMPARE AH COMPUTED TO AH IN TABLE
DIFFERENT
320
REPORT PROBLEM
SAME
328
COMPUTE VH OF FILE
324
ERROR RECOVERY
332
COMPARE VH COMPUTED TO VH IN TABLE
DIFFERENT
336
REPORT PROBLEM
SAME
340
CORRECTIVE ACTION
344
NEXT FILE
END

FIG. 5

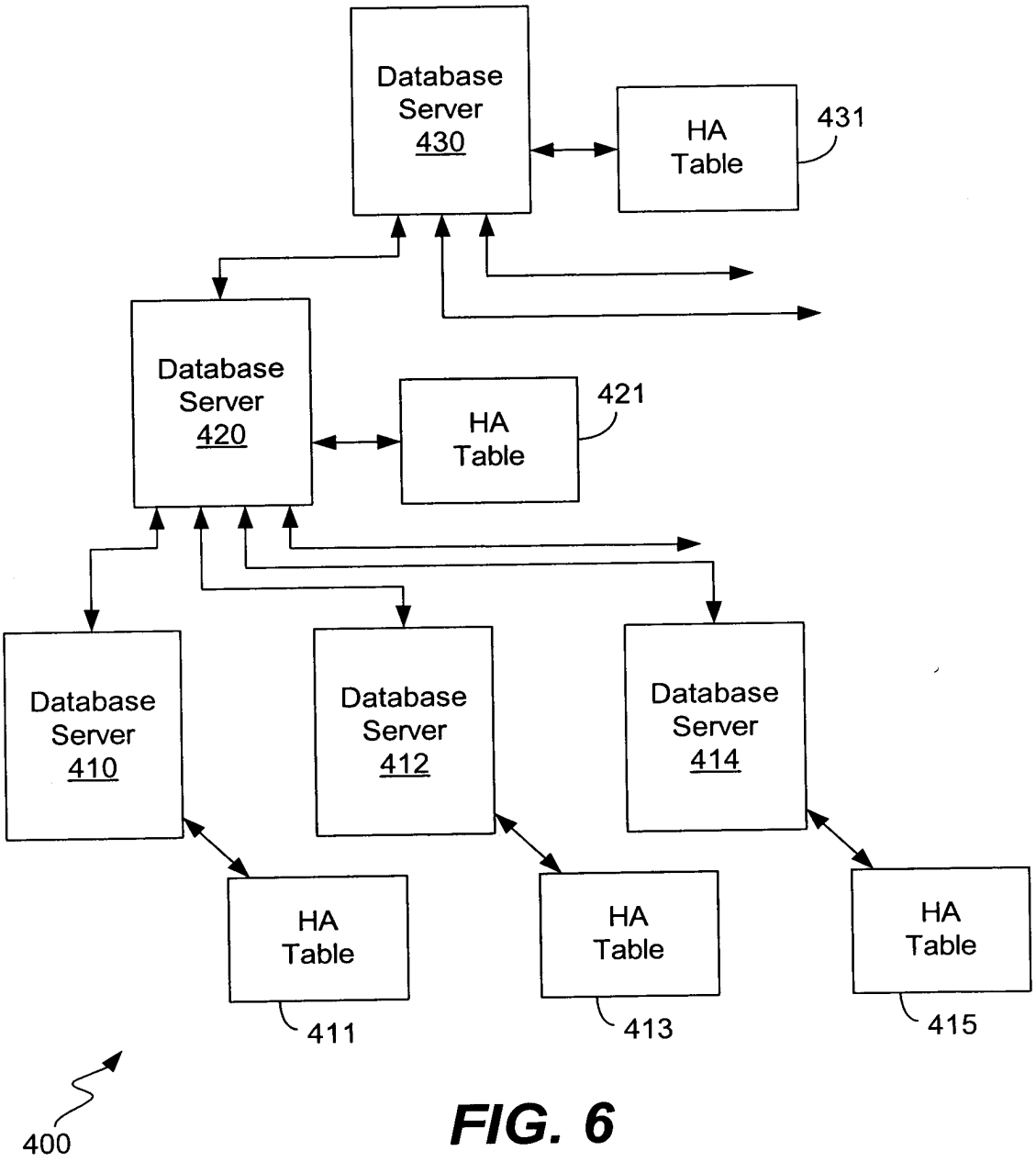


FIG. 6

Multi-Level Database

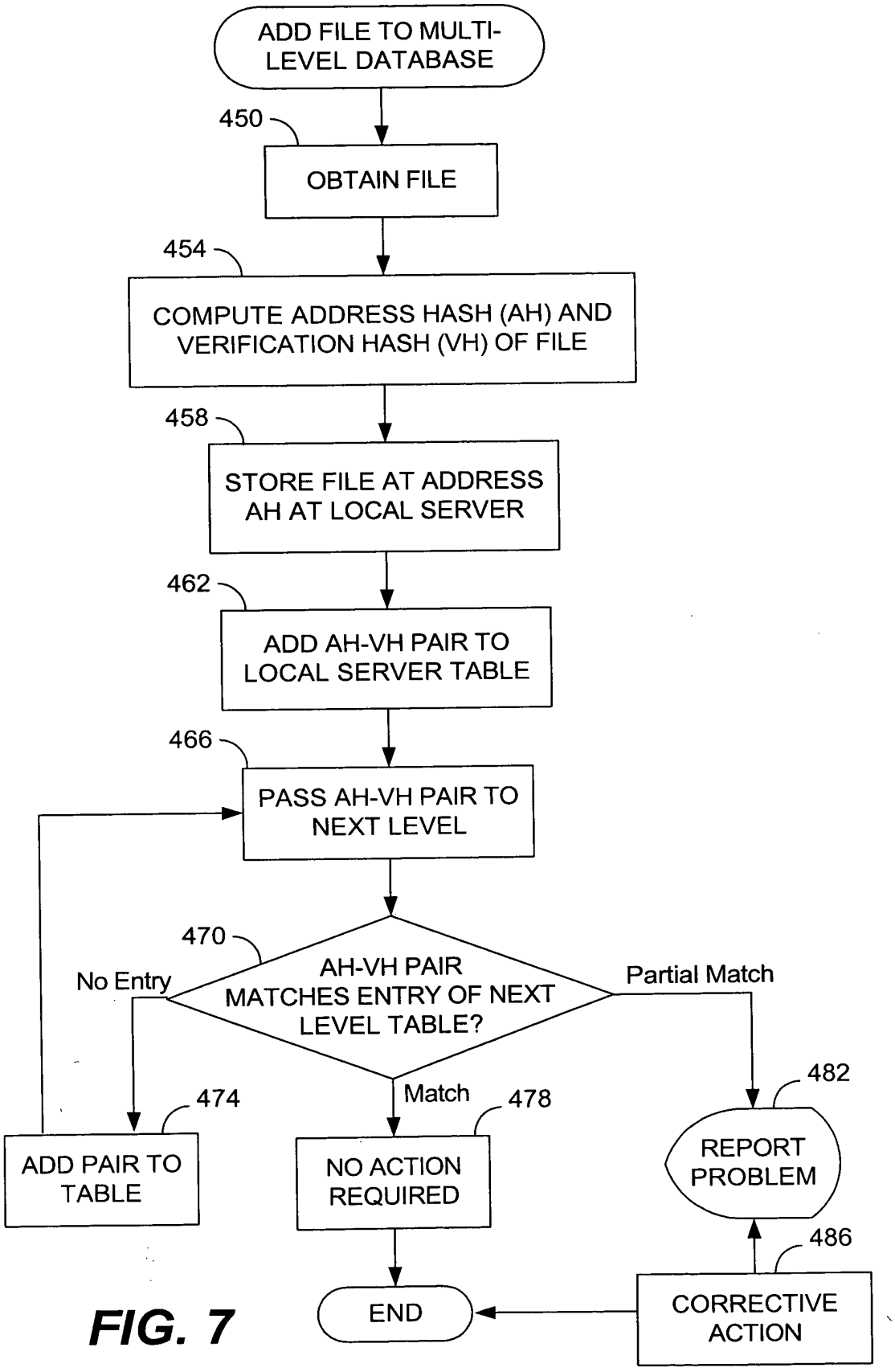

ADD FILE TO MULTI-LEVEL DATABASE
450
OBTAIN FILE
454
COMPUTE ADDRESS HASH (AH) AND VERIFICATION HASH (VH) OF FILE
458
STORE FILE AT ADDRESS AH AT LOCAL SERVER
462
ADD AH-VH PAIR TO LOCAL SERVER TABLE
466
PASS AH-VH PAIR TO NEXT LEVEL
470
AH-VH PAIR MATCHES ENTRY OF NEXT LEVEL TABLE?
No Entry
Partial Match
Match
474
ADD PAIR TO TABLE
478
NO ACTION REQUIRED
482
REPORT PROBLEM
486
CORRECTIVE ACTION
END

FIG. 7

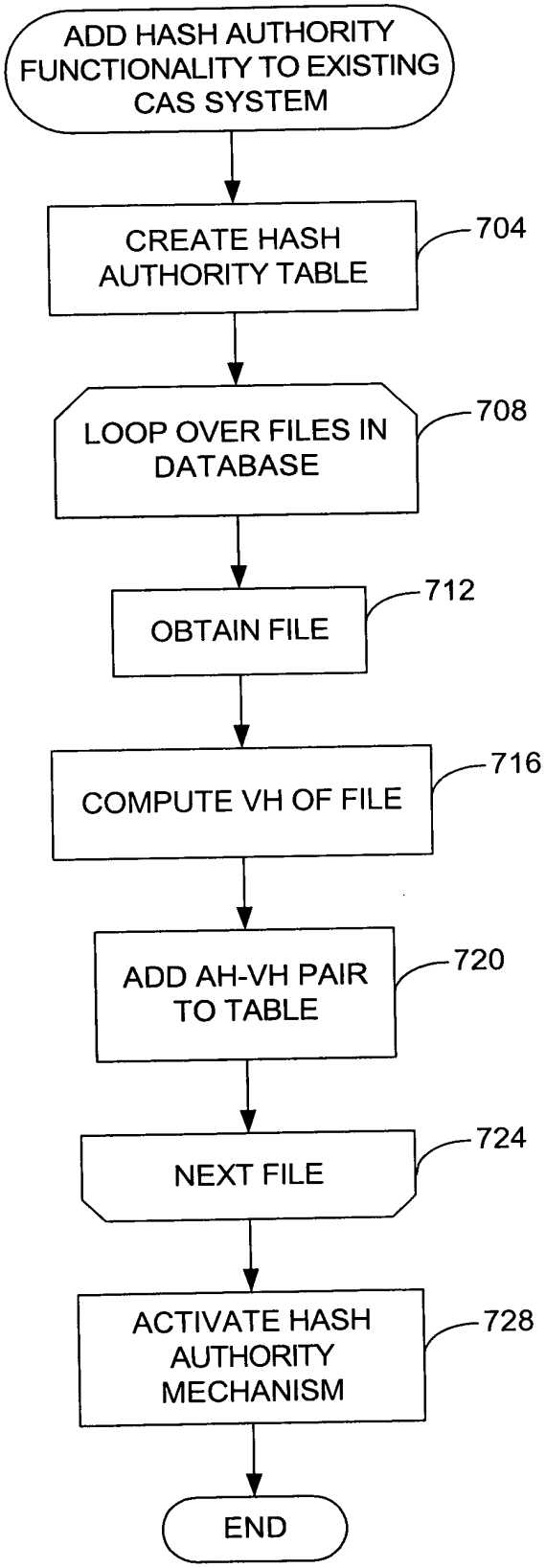

ADD HASH AUTHORITY FUNCTIONALITY TO EXISTING CAS SYSTEM
CREATE HASH AUTHORITY TABLE
704
LOOP OVER FILES IN DATABASE
708
OBTAIN FILE
712
COMPUTE VH OF FILE
716
ADD AH-VH PAIR TO TABLE
720
NEXT FILE
724
ACTIVATE HASH AUTHORITY MECHANISM
728
END

FIG. 8

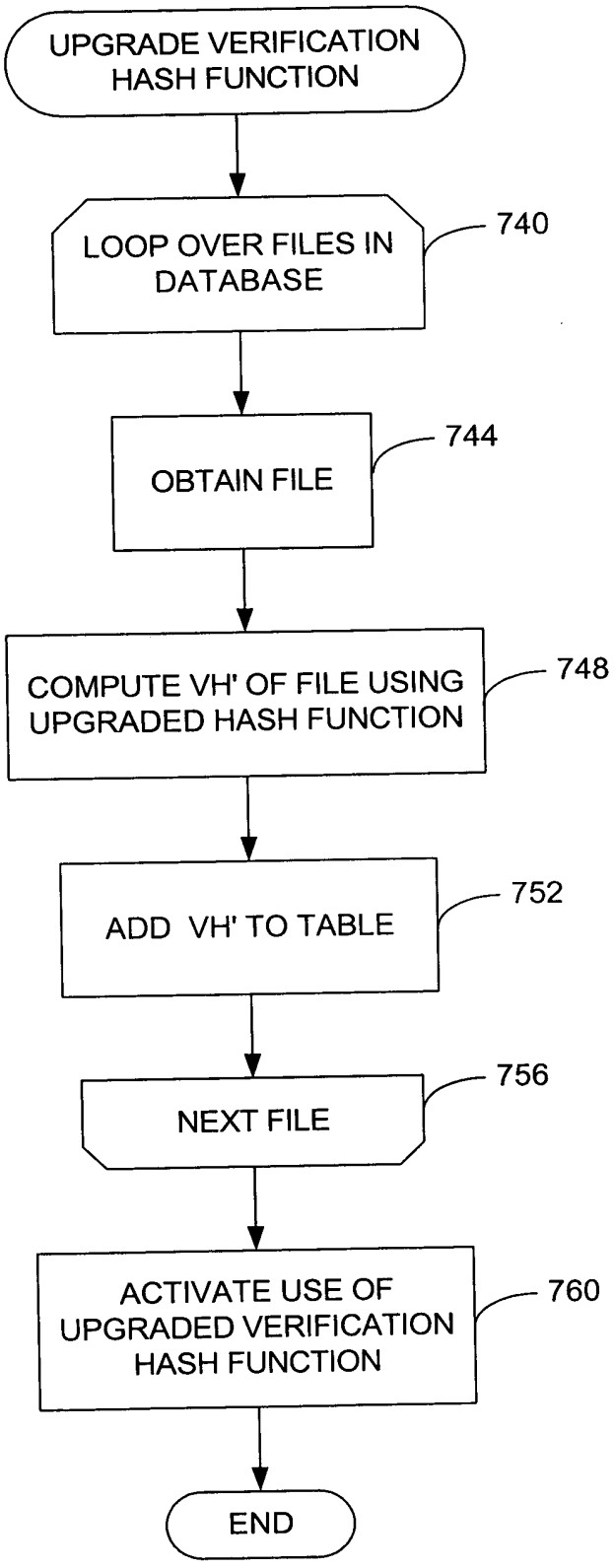

UPGRADE VERIFICATION HASH FUNCTION
LOOP OVER FILES IN DATABASE
740
OBTAIN FILE
744
COMPUTE VH' OF FILE USING UPGRADED HASH FUNCTION
748
ADD VH' TO TABLE
752
NEXT FILE
756
ACTIVATE USE OF UPGRADED VERIFICATION HASH FUNCTION
760
END

FIG. 9

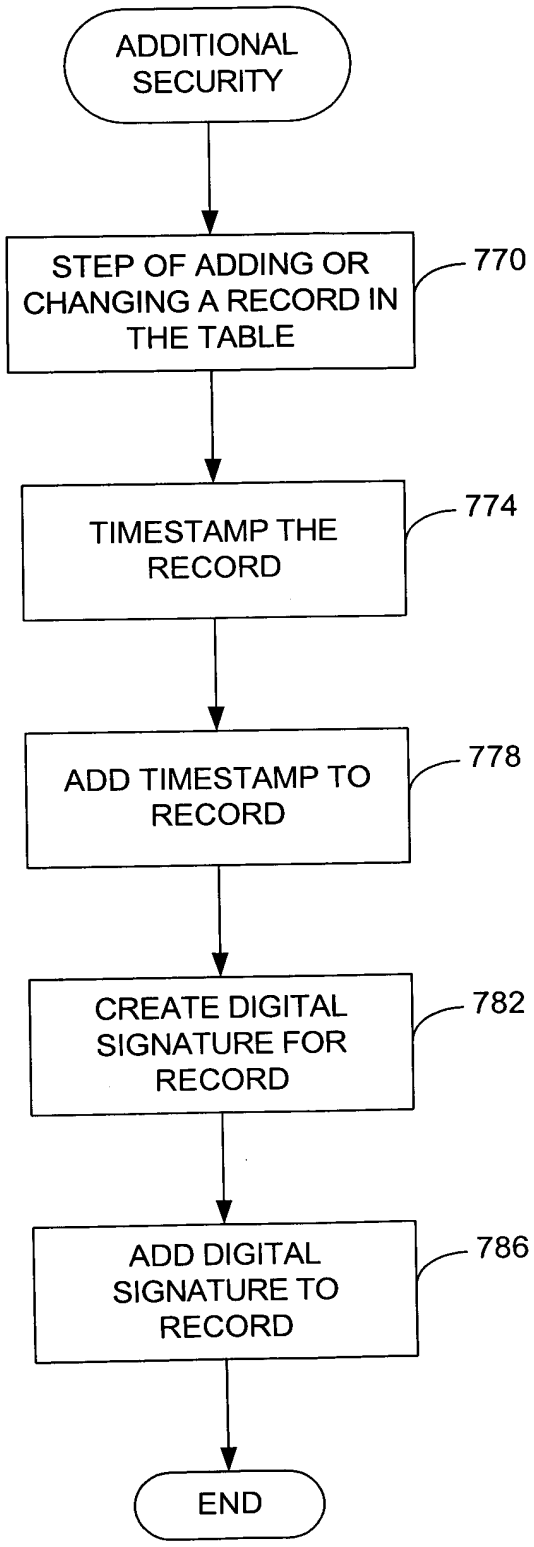
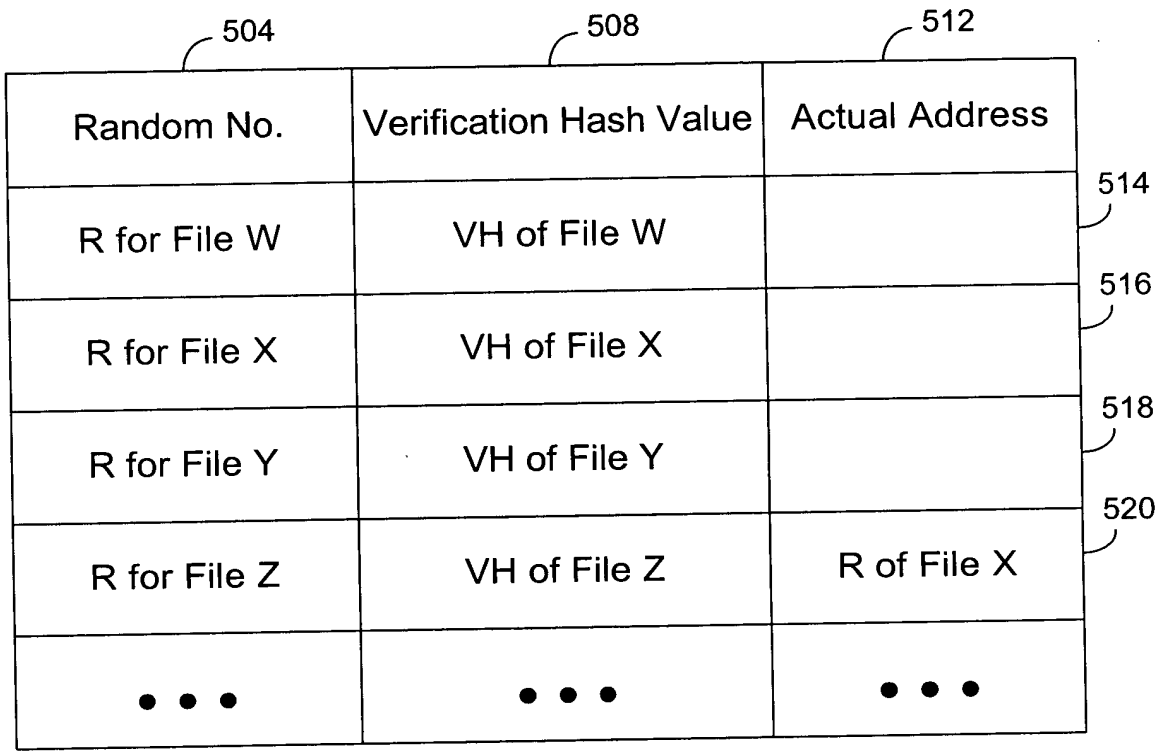

ADDITIONAL SECURITY
STEP OF ADDING OR CHANGING A RECORD IN THE TABLE
770
TIMESTAMP THE RECORD
774
ADD TIMESTAMP TO RECORD
778
CREATE DIGITAL SIGNATURE FOR RECORD
782
ADD DIGITAL SIGNATURE TO RECORD
786
END

FIG. 10



Identifier Authority Table

FIG. 12

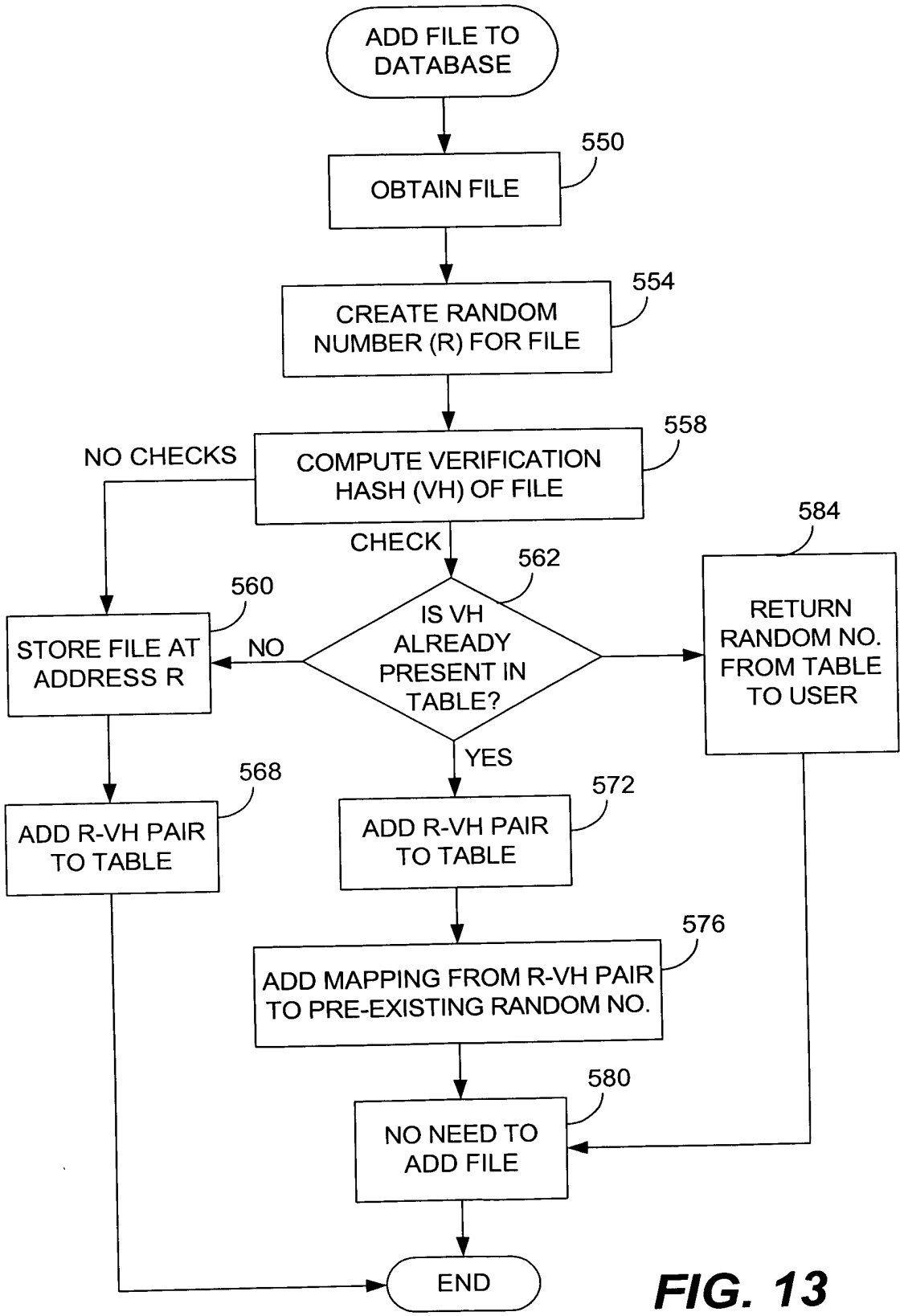

ADD FILE TO DATABASE
550
OBTAIN FILE
554
CREATE RANDOM NUMBER (R) FOR FILE
558
NO CHECKS
COMPUTE VERIFICATION HASH (VH) OF FILE
CHECK
562
584
560
STORE FILE AT ADDRESS R
NO
IS VH ALREADY PRESENT IN TABLE?
RETURN RANDOM NO. FROM TABLE TO USER
YES
568
572
ADD R-VH PAIR TO TABLE
ADD R-VH PAIR TO TABLE
576
ADD MAPPING FROM R-VH PAIR TO PRE-EXISTING RANDOM NO.
580
NO NEED TO ADD FILE
END

FIG. 13

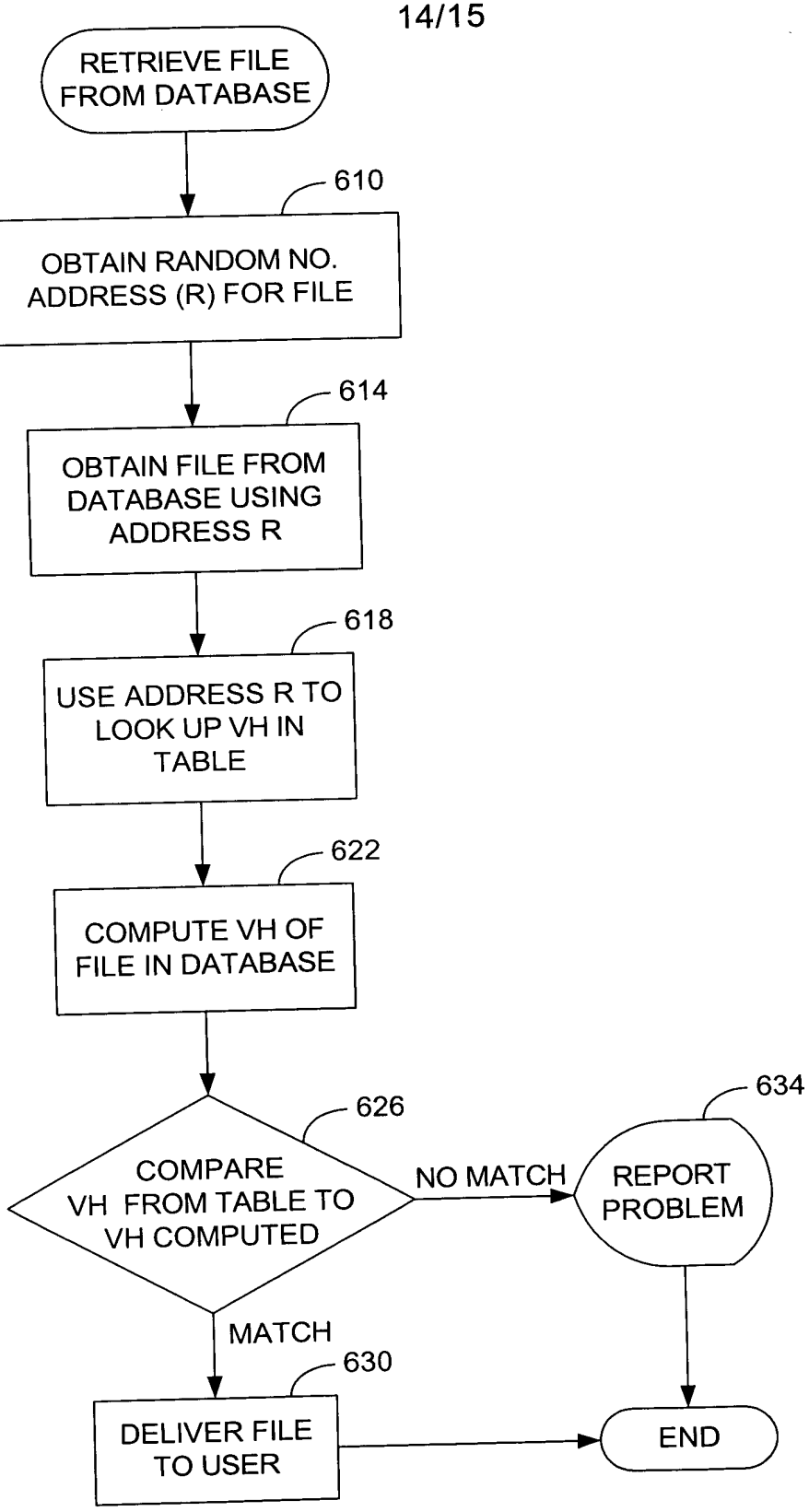

RETRIEVE FILE FROM DATABASE
610
OBTAIN RANDOM NO. ADDRESS (R) FOR FILE
614
OBTAIN FILE FROM DATABASE USING ADDRESS R
618
USE ADDRESS R TO LOOK UP VH IN TABLE
622
COMPUTE VH OF FILE IN DATABASE
626
COMPARE VH FROM TABLE TO VH COMPUTED
NO MATCH
634
REPORT PROBLEM
MATCH
630
DELIVER FILE TO USER
END

FIG. 14

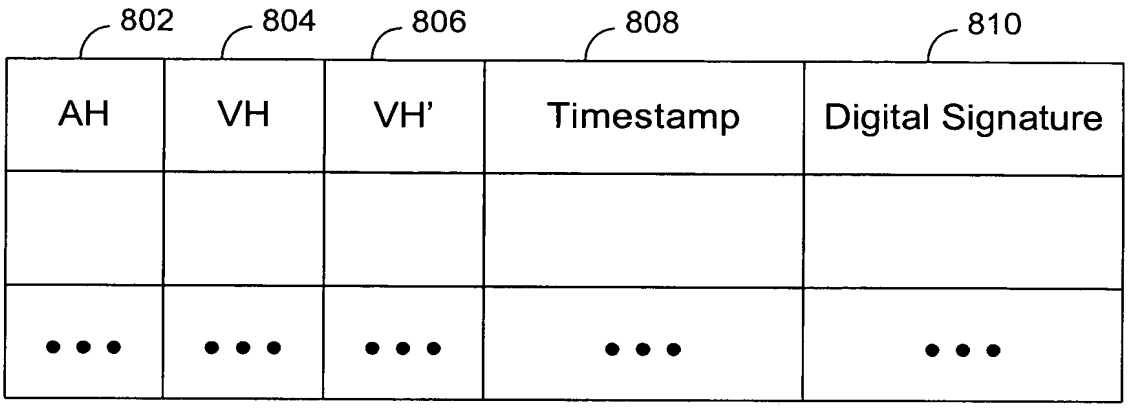

802
804
806
808
810
AH
VH
VH'
Timestamp
Digital Signature
800

FIG. 11

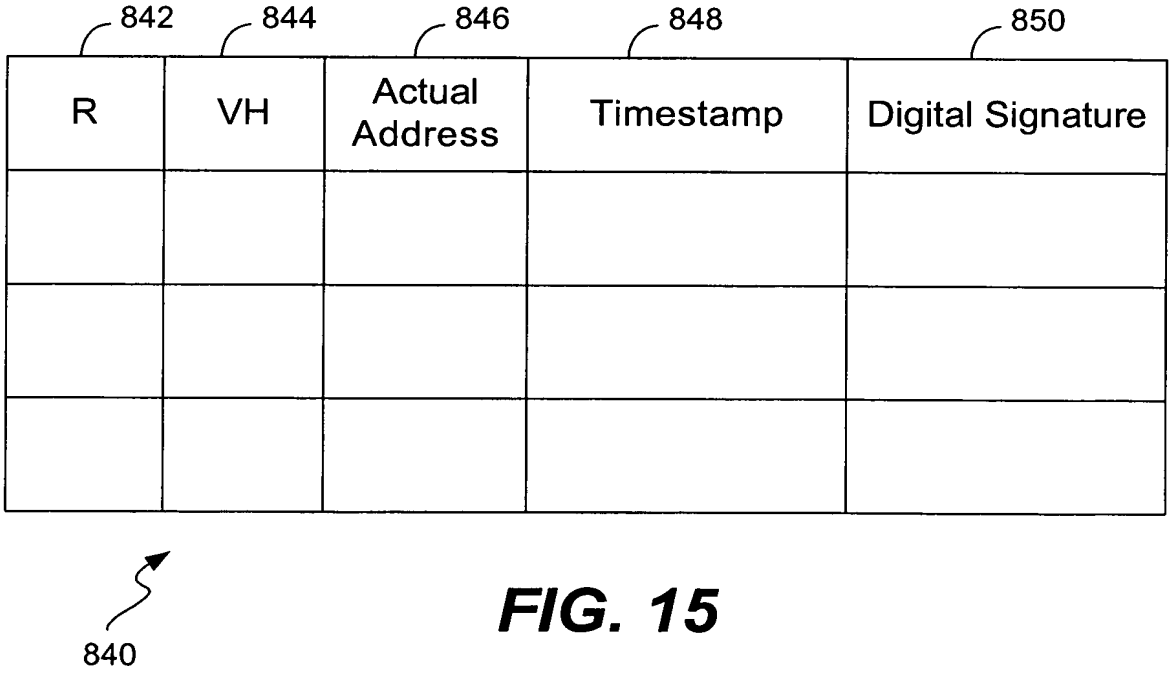

842
844
846
848
850
R
VH
Actual Address
Timestamp
Digital Signature
840

FIG. 15

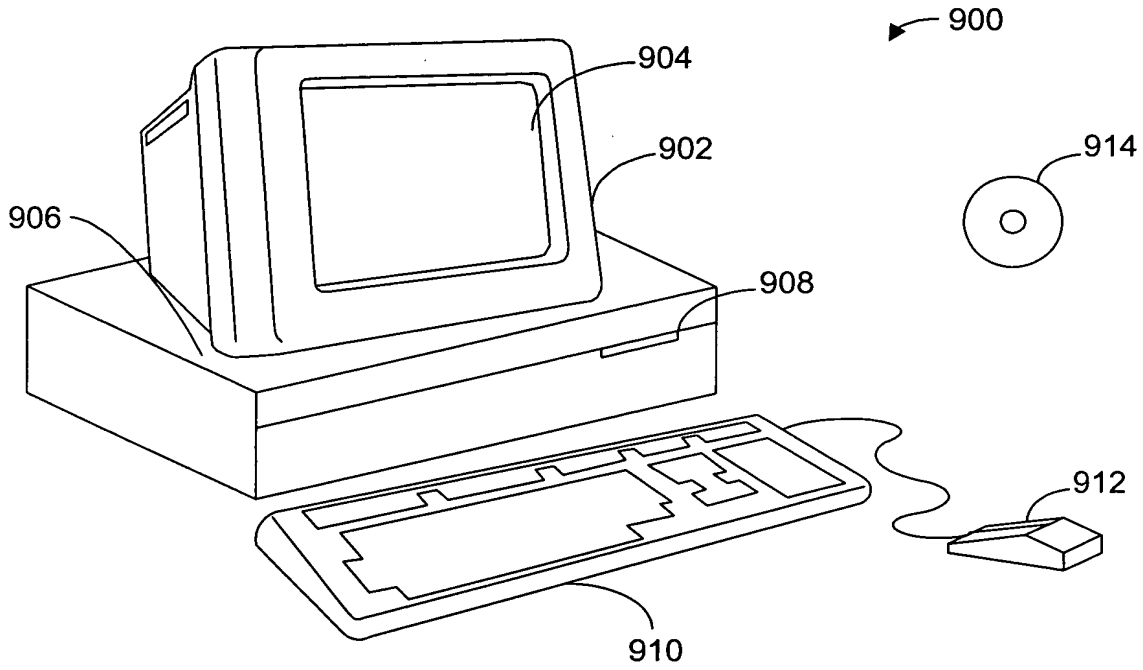


FIG. 16A

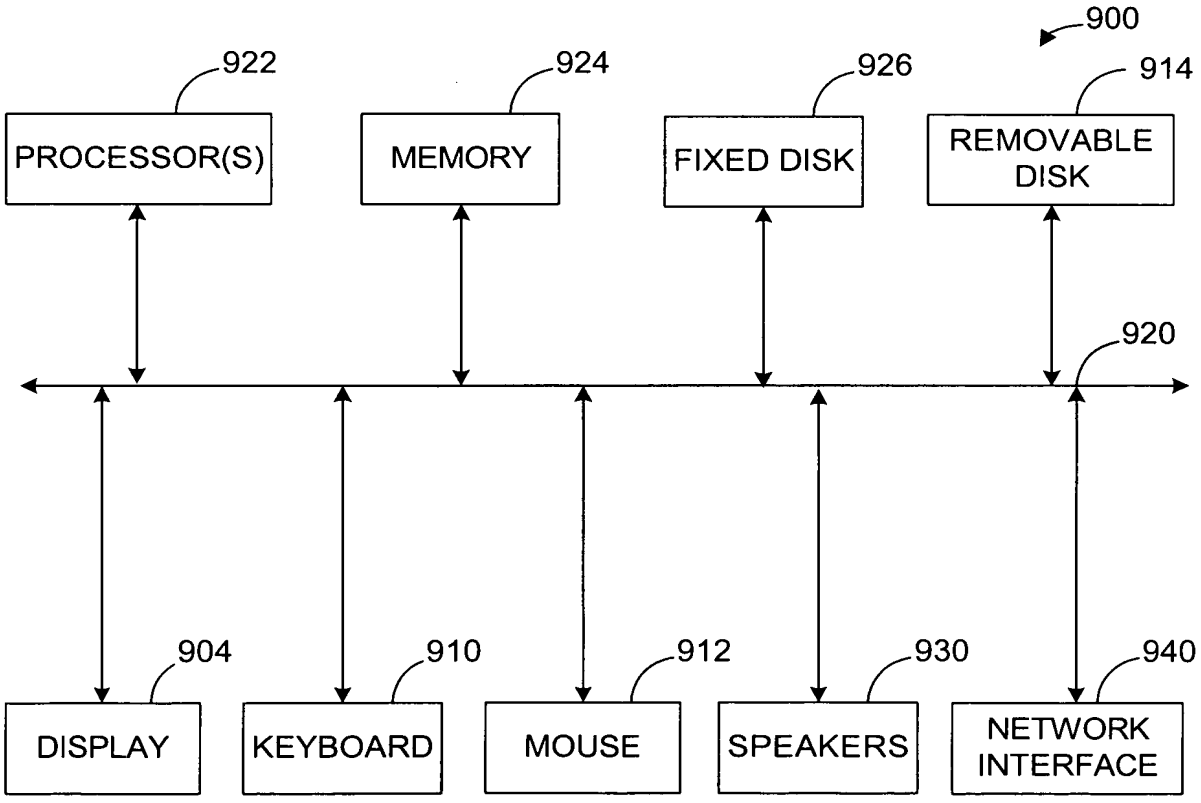


FIG. 16B